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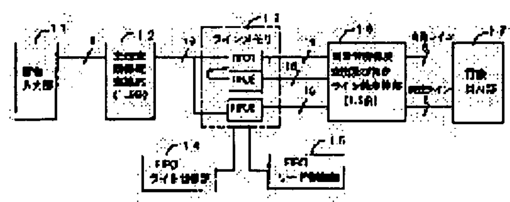
(54) APPARATUS FOR PROCESSING IMAGE

(57)Abstract:

PROBLEM TO BE SOLVED: To make a circuit constitution small in scale and speed up a data transmission rate.

SOLUTION: After a resolution in a main scan direction is changed at a main scan resolution change part 12, the changed output is held in a line memory 13. A sub scan resolution change and transmission line count change part 16 changes a resolution in a sub scan direction with the use of image data of a plurality of lines stored in the line memory 13. The change is constituted so as to enable an output in m lines. Image data of a count of lines (e.g. 3 lines) necessary for the resolution change to obtain the output in (m) lines (e.g. m=2) are secured in the line memory. Since a resolution change process is constituted so that the (m) lines are output as a result of the resolution change in the sub scan direction, both the resolution change process and a change from an n-line transmission to an m-line transmission can be carried out at the same time.



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[Claim(s)]

[Claim 1] A means to input the 1st image data per n lines, and a means to change a n line transfer into m (however, m>n) Rhine transfer, and to generate the 2nd image data at the same time it high-resolution--ization-processes the 1st image data, A means to have a means to make scan the 2nd image data sent by m line transfer with m beams, and to form the 2nd image, and to generate said 2nd image data The image processing system which performs high resolution-ized processing in which the output of high resolution-ized processing becomes m lines, and is characterized by having the Rhine memory holding two or more Rhine which is the need in high resolution-ized processing of the m line-out.

[Claim 2] The image processing system according to claim 1 which high resolution-ized processings are resolution conversion of a main scanning direction, and resolution conversion of the direction of vertical scanning, and performs resolution conversion of the direction of vertical scanning, and the Rhine transfer conversion after performing resolution conversion of a main scanning direction.

[Claim 3] The image processing system according to claim 1 which high resolution-ized processings are resolution conversion of a main scanning direction, and resolution conversion of the direction of vertical scanning, and performs resolution conversion of a main scanning direction after performing resolution conversion of the direction of vertical scanning, and the Rhine transfer conversion.

[Claim 4] An image input means to input the 1st image data per n lines, and the 1st conversion means which performs resolution conversion of a main scanning direction, The Rhine memory which has a capacity required for the resolution conversion outputted by m lines of the direction of vertical scanning, and holds the image data of two or more lines after the horizontal-scanning resolution conversion by the 1st conversion means, By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines The image processing system characterized by having the 2nd conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence, and an image output means to make scan the 2nd image data sent by m line transfer from said 2nd conversion means with m beams, and to form the 2nd image.

[Claim 5] Said 1st conversion means is an image processing system according to claim 4 characterized by being the thing which generate the odd-numbered pixel after resolution conversion, and the even-numbered pixel to coincidence, and transmits to juxtaposition by carrying out these by the adjoining S pixels (S>=1) interpolation operation.

[Claim 6] Said 2nd conversion means is an image processing system according to claim 4 characterized by having m conversion operation part corresponding to output Rhine several m since it outputs by m line transfer.

[Claim 7] An image input means to input the 1st image data per n lines, and the Rhine memory which has a capacity required for the vertical-scanning resolution conversion outputted per m lines, and holds the image data of two or more lines from an image input means, By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines The 1st conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence, The 2nd conversion means which performs horizontal-scanning resolving conversion for every Rhine of the image data of m lines which the 1st conversion means outputs, and generates the 2nd image data, The image processing system characterized by having an image output means to make scan the 2nd image data sent by m line transfer from said 2nd conversion means with m beams, and to form the 2nd image.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In an image processing system with the image output section which coincidence makes scan two or more beams, and carries out image formation, this invention relates to the equipment for obtaining the output image of resolution which changes the resolution of an input image and is different while enabling a coincidence transfer of two or more line image information for the coincidence scan of two or more beams.
[0002]
[Description of the Prior Art] As the image-processing approach of changing the conventional resolution, performing two-dimensional resolution conversion on real time is indicated by JP,6-18433,B. This approach holds every 2 pixels which adjoins one certain main scanning direction to a shift register, it memorizes them in the 1st Rhine memory, changing the resolution of a main scanning direction by carrying out a interpolation operation in those 2 pixels each, and it is memorized in the 2nd Rhine memory, changing the resolution of the main scanning direction same about one horizontal-scanning Rhine following a degree. By carrying out a interpolation operation in the meantime, the image information of new Rhine generated by interpolation is outputted to a serial one by one, reading the 1st line memory and the 2nd line memory. It is made to carry out two-dimensional resolution conversion to real time, repeating such actuation.
[0003] Moreover, on the occasion of the light beam scan of image formation equipment, the multi-beam scanning mode which aims at high-speed actuation using two or more light beams is known from the former. For example, the image-processing approach of changing into two or more beam (2) output the data transmitted per one line is shown by JP,58-145914,A. This approach has two control sections, the 1st and the 2nd, the 1st control section has two Rhine memory, the 1st and the 2nd, the 2nd control section has two Rhine memory, the 3rd and the 4th, and these 1st and 2nd control sections perform writing and read-out in the Rhine memory by turns. That is, information is read from the 3rd of the 2nd control section, and the 4th Rhine memory to the 1st of the 1st control section, and the 2nd Rhine memory at juxtaposition at the same time it writes the signal of two scan lines where a picture signal adjoins in the 1st period. Conversely, storage information is read from the 1st of the 1st control section, and the 2nd Rhine memory to juxtaposition, it outputs at the 2nd period, and the signal of two scan lines following the 3rd and 4th memory of the 2nd control section is written in. Thus, by outputting to the Rhine memory, carrying out the buffer link of the information for 2 scan lines, conversion for two or more beam output is performed.
[0004]
[Problem(s) to be Solved by the Invention] In the field of an image processing system, resolution conversion of image information is performed and the case where it is said that two or more Rhine of the conversion output is outputted to coincidence for the output unit of a multi-beam actuation method can be considered. In that case, it is easily realizable by combining two above-mentioned Prior arts. That is, it should just be made to perform conversion for said conventional two or more beam output, after performing said conventional resolution conversion. However, since resolution transform processing and transform processing for two or more beam output must be performed to a serial, while a configuration becomes complicated according to such an approach, a manufacturing cost becomes high and the problem that a data transfer rate cannot be made high, either arises. This invention makes it a technical problem to solve such a problem, to consider the image processing system which performs resolution conversion of image data, and the number conversion of transfer Rhine as a comparatively easy configuration, and to manufacture to low cost, and to realize a high-speed-data transfer rate.
[0005]
[Means for Solving the Problem and its Function] This invention has a means (11) to input the 1st image data per n lines, a means (12-16) to change a n line transfer into m (however, m>n) Rhine transfer, and to generate the 2nd image data while high-resolution--ization-processing the 1st image data, and a means (17) to make scan the 2nd image data sent by m line transfer with m beams, and to form the 2nd image. And a means to generate said 2nd image data performs high resolution-ized processing in which the output of high resolution-ized processing becomes m lines, and is characterized by having the Rhine memory holding two or more Rhine which is the need in high resolution-ized processing of the m line-out. After performing resolution conversion of the direction of vertical scanning, and the Rhine transfer conversion even if it constitutes so that resolution conversion of the direction of vertical scanning and the Rhine transfer conversion may be performed after consisting of resolution conversion of a main scanning direction, and resolution conversion of the direction of vertical scanning and performing resolution conversion of a main scanning direction or, specifically, high resolution-ized processing may be constituted so that resolution conversion of a main scanning direction may be performed. In this invention, since a means generated the 2nd image data was constituted so that high resolution-ized processing which is the need about the Rhine memory used for high resolution-

ized processing at high resolution-ized processing of m line-out in_which more than one are made into the capacity of Rhine, and the output of high resolution-ized processing becomes m lines might be performed, it can perform high resolution-ized processing and conversion to the m line transfer from a n line transfer at a stretch. Therefore, this invention can time improvement in the speed of a data transfer rate while being able to make circuitry small-scale like the conventional technique compared with performing the number conversion of transfer Rhine, after performing resolution conversion.

[0006] An image input means by which the image processing system by other modes of this invention inputs the 1st image data per n lines (11), The 1st conversion means which performs high resolution-ized transform processing of a main scanning direction (12), the resolution conversion outputted by m lines of the direction of vertical scanning -- it having a required capacity and with the Rhine memory (13-15) holding the image data of two or more lines after the horizontal-scanning resolution conversion by the 1st conversion means By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines It is characterized by having an image output means (17) to make scan the 2nd image data sent by m line transfer from the 2nd conversion means (16) and 2nd conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence with m beams, and to form the 2nd image. This invention holds the conversion output in the Rhine memory, after performing resolution conversion of a main scanning direction with the 1st inverter. The 2nd inverter performs resolution conversion of the direction of vertical scanning using the image data of two or more lines memorized by the Rhine memory. The conversion is constituted so that the output in m lines may be possible, and the image data of a number required to carry out resolution conversion of m line-out to the Rhine memory of Rhine is held. Since this invention performs high resolution-ized processing which is the need about the Rhine memory used for high resolution-ized processing at high resolution-ized processing of m line-out in which two or more capacity of Rhine is secured and the output of high resolution-ized processing becomes m lines, like the above-mentioned, it can perform high resolution-ized processing and conversion to the m line transfer from a n line transfer at a stretch. Therefore, this invention can time improvement in the speed of a data transfer rate while being able to make circuitry small-scale like the conventional technique compared with performing the number conversion of transfer Rhine, after performing resolution conversion.

[0007] In the image processing system of above-mentioned this invention, in the one concrete mode, said 1st conversion means generates the odd-numbered pixel after resolution conversion, and the even-numbered pixel to coincidence, and outputs by making these juxtaposition by the adjoining S pixels (S>=1) interpolation operation. According to this invention, since it can transmit 2 pixels at a time to juxtaposition by carrying out, an image data transfer rate can be substantially made quick.

[0008] In the image processing system of above-mentioned this invention, in the one concrete mode, since it outputs by m line transfer, said 2nd conversion means has m conversion operation part (741-743, the operation part that consists of 751 and 761, 744-746, operation part which consists of 752 and 762) corresponding to output Rhine several m.

[0009] The image processing system by the mode of further others of this invention An image input means to input the 1st image data per n lines (101), The Rhine memory which has a capacity required for the vertical-scanning resolution conversion outputted per m lines, and holds the image data of two or more lines from an image input means (103-105), By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines The 1st conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence (106), The 2nd conversion means which performs high resolution-ized transform processing of a main scanning direction for every Rhine of the image data of m lines which the 1st conversion means outputs, and generates the 2nd image data (102), It is characterized by having an image output means (107) to make scan the 2nd image data sent by m line transfer from the 2nd conversion means with m beams, and to form the 2nd image. The above-mentioned invention can time improvement in the speed of a data transfer rate while the operation effectiveness as the whole is the same and can make circuitry small-scale, although this invention makes reverse sequence of horizontal-scanning resolution conversion and vertical-scanning resolution conversion.

[0010]

[The mode of implementation of invention]

(Mode of the 1st operation) drawing 1 -- the voice of operation of the 1st of this invention -- it is the block diagram showing the configuration of the outline of the image processing system twisted like. This image processing system A document image is scanned. The image obtained The image data of the scan line referred to at resolution transform processing of the image input section 11 inputted per n lines (an example one-line unit), the horizontal-scanning resolution transducer 12 which changes the resolution of the main scanning direction of an input image, and the vertical-scanning resolution transducer 16 mentioned later By FIFO (first-in-first-out mold memory) to hold While changing the resolution of the constituted Rhine memory 13, the light control section 14 which controls the writing to

FIFO of the Rhine memory 13, the FIFO lead control section 15 which controls the read from FIFO of the Rhine memory 13, and the direction of vertical scanning It consists of a vertical-scanning resolution transducer 16 which carries out Rhine conversion, and the image output section 17 constituted so that two or more beams might perform an image output. The vertical-scanning resolution transducer 16 is constituted so that it can output per m lines, in order to unite for [in the image output section 17] the beam (this example 2) output of m.

[0011] Drawing 2 is the block diagram showing the detail of the horizontal-scanning resolution transducer 12. The pixel extract circuit 21 for an operation for the horizontal-scanning resolution transducer 12 to extract two or more pixels each required for the horizontal-scanning resolution operation of the image information of the horizontal-scanning line from the image input section 11 (this example 3 pixels) which adjoined to coincidence, The 1st operation part 22 which computes odd pixels after resolution conversion by the interpolation operation based on the pixel for an operation which the pixel extract circuit 21 for an operation extracted, It consists of the 2nd operation part 23 which computes even pixels after resolution conversion by the interpolation operation based on the pixel for an operation which the pixel extract circuit 21 for an operation extracted. The pixel extract circuit 21 for an operation has the latch circuit 211 which delays an input pixel by 1 pixel, and the latch circuit 212 which delays the output of a latch circuit 211 by 1 pixel. The 1st operation part 22 is equipped with the multipliers 221, 222, and 223 which carry out the multiplication of the multiplier for interpolation to the pixel which the pixel extract circuit 21 for an operation outputs, the multiplier change section 224, and the adder unit 225 adding the output of multipliers 221-223. Moreover, the 2nd operation part 23 is equipped with the multipliers 232 and 233 which carry out the multiplication of the multiplier for interpolation to the pixel which the pixel extract circuit 21 for an operation outputs, the multiplier change section 234 for even pixels, and the adder unit 235 adding the output of multipliers 232 and 233.

[0012] Since the latch circuit 211 of the pixel extract circuit 21 for an operation and latch 212 are delayed in 1 pixel, respectively, continuous 3 pixels which the pixel from the image input section 11 which does not pass the r-th pixel to a latch circuit 212, and does not pass the r-1st pixels and a latch circuit to a latch circuit 211 makes the r-2nd pixels are obtained. Namely, the pixel extract circuit 21 for an operation can obtain to coincidence 3 pixels followed on one line (scanning line), and can supply them to a multiplier group. In drawing 3 (a), the 3rd line shows the pixel train as which the 1st line is inputted into the pixel train of the input image to multipliers 223 and 233, and the 2nd line is inputted into multipliers 222 and 232 from a latch circuit 211, and the pixel train inputted into a multiplier 221 from a latch circuit 212. To timing t2, a pixel 2 is obtained by the input side of multipliers 223 and 233, and a pixel 1 is obtained by the input side of multipliers 222 and 232. Henceforth [timing t3], three pixels which adjoined multipliers 221, 222, and 223 and multipliers 232 and 233 in the main scanning direction, respectively are obtained by coincidence.

[0013] a multiplier -- 221 - 223 -- a multiplier -- a change -- the section -- 224 -- and -- an adder -- 225 -- from -- constituting -- having -- an arithmetic circuit -- conversion -- a front -- a pixel -- one -- two -- three -- P - one -- P -- from -- becoming -- an input -- an image -- from -- resolution -- having changed -- odd -- a position -- an output -- a pixel -- one -- ' -- three -- ' -- Q - one -- from -- becoming -- an output -- an image -- obtaining . a multiplier -- 209 -- 210 -- even -- a pixel -- ** -- a multiplier -- a change -- the section -- 211 -- and -- an adder -- 212 -- from -- constituting -- having -- an arithmetic circuit -- conversion -- a front -- a pixel -- one -- two -- three -- P - one -- P -- from -- becoming -- an input -- an image -- from -- resolution -- having changed -- even -- a position -- watch -- ** -- an output -- a pixel -- two -- ' -- a pixel -- four -- ' -- Q -- from -- becoming -- an output -- an image -- obtaining . When doubling resolution 1.5, an example of the resolution conversion by the operation of interpolation is explained below for two points. In addition, the approach of resolution conversion is well-known and can adopt the interpolation approach of arbitration, such as other interpolation between four points.

[0014] The pixel value of pixel 1' = (5/6) the pixel value of the pixel value +(1/6) x pixel 2 of the x pixel 1.
The pixel value of pixel 2' = (1/6) the pixel value of the pixel value +(5/6) x pixel 2 of the x pixel 1.
The pixel value of pixel 3' = (1/2) the pixel value of the pixel value +(1/2) x pixel 3 of the x pixel 2.
The pixel value of pixel 4' = (5/6) the pixel value of the pixel value +(1/6) x pixel 4 of the x pixel 3.
The pixel value of pixel 5' = (1/6) the pixel value of the pixel value +(5/6) x pixel 4 of the x pixel 3.
The pixel value of pixel 6' = (1/2) the pixel value of the pixel value +(1/2) x pixel 5 of the x pixel 4.
The pixel value of pixel 7' = (5/6) the pixel value of the pixel value +(1/6) x pixel 6 of the x pixel 5.
The pixel value of pixel 8' = (1/6) the pixel value of the pixel value +(5/6) x pixel 6 of the x pixel 5.
The pixel value of pixel 9' = (1/2) the pixel value of the pixel value +(1/2) x pixel 7 of the x pixel 6.
...... [0015] odd number -- an output -- a pixel -- ** -- a multiplier -- 221 -- **** -- drawing 3 -- (-- b --) -- being shown -- as -- a pixel -- one -- ' -- seven -- ' -- 13 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- zero -- multiplication -- carrying out -- a pixel -- a pixel -- three -- ' -- nine -- ' -- 15 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 1/2 -- multiplication -- carrying out -- pixel 3', 9', and 15' -- in the timing which asks for -- the multiplication of the multipliers 1/6 be carried out to an input pixel. a multiplier -- 222 -- **** -- a pixel -- one -- ' -- five -- ' -- seven -- ' -- 11 -- ' -- 13 -- ' -- asking -- timing -- setting -- an input pixel -- five sixths -- multiplication --

carrying out -- pixel 3', 9', and 15' -- in the timing which asks for --, the multiplication of the multipliers 1/6 is carried out to an input pixel. a multiplier -- 223 -- **** -- a pixel -- one -- ' -- seven -- ' -- 13 -- ' -- asking -- timing -- setting -- an input -- a pixel -- one -- /-- six -- multiplication -- carrying out -- a pixel -- three -- ' -- five -- ' -- nine -- ' -- 11 -- ' -- asking -- timing -- setting -- an input pixel -- a multiplier 0 -- multiplication -- carrying out . The multiplier by which it multiplies with the above multipliers 221, 222, and 223 for odd number output pixels is changed one by one by the multiplier change section 224.

[0016] As shown in drawing 3 (c), in the multiplier 209 for even number output pixels Pixel 2', eight -- ' -- 14 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- one -- /-- six -- multiplication -- carrying out -- a pixel -- a pixel -- four -- ' -- ten -- ' -- 16 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 5/6 -- multiplication -- carrying out -- pixel 6', 12', and 18' -- in the timing which asks for --, the multiplication of the multipliers 1/2 is carried out to an input pixel. a multiplier -- 210 -- a pixel -- two -- ' -- eight -- ' -- 14 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- five -- /-- six -- multiplication -- carrying out -- a pixel -- a pixel -- four -- ' -- ten -- ' -- 16 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 1/6 -- multiplication -- carrying out -- pixel 6', 12', and 18' -- in the timing which asks for --, the multiplication of the multipliers 1/2 is carried out to an input pixel. The multiplier by which it multiplies with the above multipliers 209 and 210 for even number output pixels is changed one by one by the multiplier change section 211 for even pixels.

[0017] In an adder 225, it obtains odd pixels each by addition of the value acquired with multipliers 221-223. For example, an adder 225 performs addition with the pixel value of the x (5/6) pixel 1 which a multiplier 222 outputs, and the pixel value of the x (1/6) pixel 2 which a multiplier 223 outputs, in order to compute the pixel value of pixel 1'. In an adder 212, it obtains even pixels each by adding the value acquired with multipliers 209 and 210. For example, in order to calculate the pixel value of pixel 2', addition with the pixel value of the x (1/6) pixel 1 which a multiplier 209 outputs, and the x (5/6) pixel 2 which a multiplier 210 outputs is performed.

[0018] an adder -- 225 -- outputting -- having -- resolution -- conversion -- a result -- odd -- a position -- a pixel -- one -- ' -- three -- ' -- five -- ' -- an adder -- 212 -- outputting -- having -- even -- a position -- a pixel -- two -- ' -- four -- ' -- drawing 3 -- (-- d --) -- being shown -- as -- a pair -- carrying out -- a juxtaposition output -- carrying out . When a pixel value is expressed with 8 bits, it is connected when odd pixels 8 bits and even pixels 8 bits output to juxtaposition at coincidence, and is held as data with width of face of 16 bits FIFO1 and FIFO3 of the Rhine memory 13. It is written in FIFO1 and FIFO3 FIFO1 and FIFO3 by the write enable signal of the FIFO light control section 14 as the output of the adders 225 and 212 as shown in drawing 3 (d) shows in this drawing (e), and data as shown in this drawing (f) are held in each FIFO. In addition, in this example, odd pixels and even pixels are held to juxtaposition at FIFO, and it was made to transmit to juxtaposition, also when the rate of an output system is quick for enabling it to follow in footsteps enough.

[0019] Drawing 4 shows other examples of the multiplier which performs resolution conversion with interpolation for two points. The view of drawing is the same as drawing 3 . In this case, in the configuration of drawing 2 , a multiplier 223 is omissible.

[0020] Drawing 5 (a) - (k) is drawing for explaining control of write-in read-out in the Rhine memory 13, vertical-scanning resolution conversion, and the number conversion of transfer Rhine. The image after horizontal-scanning resolution conversion (refer to drawing 3 (d)) of drawing 5 (b) is written in FIFO1 of the Rhine memory 13 of drawing 1 by the FIFO1 light signal of drawing 5 (c). A FIFO1 light signal is not generated in the place of Rhine 3, Rhine 7, Rhine 11, and --. It is written in FIFO3 to which each of those signals correspond by the FIFO3 light signal generated in the place corresponding to those Rhine 3 of drawing 5 (d), Rhine 7, Rhine 11, and --. The output of FIFO1 is written in FIFO2 by the FIFO light signal shown in drawing 5 (e).

[0021] The picture signal of two or more Rhine where the direction of vertical scanning written in FIFO 1-3 of the Rhine memory 13 as mentioned above adjoined is read by the FIFO lead signal of drawing 5 (f), and is supplied to vertical-scanning resolution conversion and the input of the number transducer 16 of transfer Rhine. the data with which drawing 5 (g) - (k) was read in FIFO 1-3 -- and two or more Rhine data generated by performing the direction resolution conversion of vertical scanning and the number conversion of transfer Rhine are shown with time. Moreover, drawing 6 shows the relation between Rhine before conversion, and Rhine after conversion. In addition, in drawing 6 , the bottom Rhine before conversion is the same as Rhine before conversion of the top of drawing, in order to make drawing legible, overlaps and is shown.

[0022] the data of FIFO2 to the 1st line -- the data of FIFO1 to the 2nd line -- reading -- the -- the data of Rhine after conversion of 1 'line and 2nd [**]' line are generated. the following FIFO lead signal -- the data of FIFO1 to the 4th line -- the data of FIFO2 to the 2nd line -- the data of FIFO3 to the 3rd line -- respectively -- reading -- 3'line after [the data of the 2nd line, and the data of the 3rd line to] conversion -- generating -- the 3' after [the data of the 3rd line, and the data of the 4th line to] conversion -- line is generated. furthermore, the following FIFO lead signal -- the data of FIFO1 to the 5th line -- the data of FIFO2 to the 4th line -- the data of FIFO3 to the 3rd line -- respectively -- reading --

the [after / the data of the 3rd read line, and the data of the 4th line to / conversion] -- 5'line -- generating -- the 6' after [the data of the 4th line, and the data of the 5th line to] conversion -- line is generated. The relation shown in drawing 5 and drawing 6 performs resolution conversion of the direction of vertical scanning, and the number conversion of transfer Rhine, repeating such actuation. The capacity of three lines which consists of FIFO1-FIFO3 the Rhine memory used for high resolution-ized processing is secured, and since it is the configuration of performing high resolution-ized processing in_which the output of high resolution-ized processing becomes two lines, high resolution-ized processing and conversion to the m line transfer (in this example, it transmits 2 line) from a n line transfer (in this example, it transmits 1 line) can be performed to coincidence. [required for high resolution-ized processing of 2 (namely, m= 2) line-out]

[0023] Drawing 7 is what shows the outline of the configuration of the equipment for performing the vertical-scanning resolution conversion and the number conversion of transfer Rhine which were explained above. The selectors 731-733 for separating the pixel which connects with juxtaposition and is held in the registers 721-723 holding the pixel by which a sequential output is carried out from each FIFO with a FIFO lead lock, and a register, It has the multipliers 744-746 for performing resolution conversion the multiplier 741 for performing resolution conversion for odd-line generation, and the number conversion of transfer Rhine - for 743 or even-line generation, and the number conversion of transfer Rhine, the multiplier change sections 751 and 752, and addition 761 and 762.

[0024] Drawing 8 shows the pixel group of Rhine after conversion generated from the pixel read from FIFO one by one with a FIFO lead clock, and its pixel. Every 2 pixels connected with the juxtaposition held with the FIFO lead clock at each FIFO are read to registers 721, 722, and 723. 1 pixel is chosen at a time by selectors 731, 732, and 733, and 2 pixels of juxtaposition in a register are given to multipliers 741, 742, and 743. That is, selectors 731, 732, and 733 change and output the juxtaposition pixel held at registers 721, 722, and 723 to a serial pixel.

[0025] The operation for vertical-scanning resolution conversion is similar with the operation at the time of the main resolution conversion. According to the scanning-line information currently held at FIFO 1-3, the scanning-line information after each conversion is computed from two or more scanning-line information before conversion by the relation according to drawing 6 . Conversion of two or more line output will also be performed to coincidence by conversion generating two scanning-lines (generally m) information to coincidence, and outputting each to coincidence. the [which is odd lines after / the image information of the 1st line before conversion, and the 2nd line to / conversion as shown in drawing 6] -- the image information of 1 '2ndwhich is line and even lines' line is computed. The operation for obtaining odd lines after conversion carries out the multiplication of the predetermined multiplier to multipliers 741-743 from **, adds them to the pixel value (8-bit information which selectors 731-733 output) of the pixel to which two line(s) correspond with an adder 761, and is performed by acquiring the pixel value of the corresponding pixel in Rhine after resolution conversion. The operation for obtaining even lines after conversion is performed by acquiring the pixel value of the pixel which carries out the multiplication of the predetermined multiplier to multipliers 744-746 from **, adds them to the pixel value of the pixel to which two line(s) correspond with an adder 762, and corresponds to it.

[0026] that is, it is shown in drawing 6 -- as -- the -- the pixel value of 1'line is calculated by the operation of pixel value x (multipliers 1/6) of the pixel value x(multipliers 5/6)+2nd line of the 1st line. A multiplier 742 performs pixel value x (multipliers 5/6) of the 1st line, it performs the operation of pixel value x (multipliers 1/6) of the 2nd line with a multiplier 741, and performs addition of these multiplication results with an adder 761. the -- the pixel value of 2'line is calculated by pixel value x (multipliers 5/6) of the pixel value x(multipliers 1/6)+2nd line of the 1st line. A multiplier 745 performs pixel value x (multipliers 1/6) of the 1st line, it performs the operation of pixel value x (multipliers 5/6) of the 2nd line with a multiplier 744, and performs addition of these multiplication results with an adder 762. the -- the pixel value of 3'line is calculated by pixel value x (multipliers 1/2) of the pixel value x(multipliers 1/2)+3rd line of the 2nd line. A multiplier 742 performs the multiplication of pixel value x (multipliers 1/2) of the 2nd line, and a multiplier 743 performs the multiplication of pixel value x (multipliers 1/2) of the 3rd line. the -- the pixel value of 4'line is calculated by pixel value x (multipliers 1/6) of the pixel value x(multipliers 5/6)+4th line of the 3rd line, a multiplier 746 performs the operation of pixel value x (multipliers 5/6) of the 3rd line, and a multiplier 744 performs the operation of pixel value x (multipliers 1/6) of the 4th line. the -- the pixel value of 5'line is calculated by pixel value x (multipliers 5/6) of the pixel value x(multipliers 1/6)+4th line of the 3rd line, a multiplier 743 performs the operation of pixel value x (multipliers 1/6) of the 3rd line, and a multiplier 742 performs the operation of pixel value x (multipliers 5/6) of the 4th line. the -- the pixel value of 6'line is calculated by pixel value x (multipliers 1/2) of the pixel value x(multipliers 1/2)+5th line of the 4th line, a multiplier 745 performs the operation of pixel value x (multipliers 1/2) of the 4th line, and a multiplier 744 performs the operation of pixel value x (multipliers 1/2) of the 5th line. From an adder 761 and an adder 762, it is outputted to coincidence for pixel each the addition of odd-pixel Rhine and even lines of every.

[0027] the 1' explained above -- line - the 6' -- it can carry out and resolution conversion of an image can be performed by [which repeat periodically the conversion actuation which obtains line every 6 next line(s)] going. And since odd

lines and even lines are outputted to coincidence, the number conversion of Rhine can also be performed to coincidence.
[0028] Drawing 8 is drawing for explaining the relation between the pixel of Rhine held at FIFO, and the pixel of two or more lines after conversion. a selector -- 731 -- 732 -- 733 -- from -- odd -- a pixel -- one - one -- ' -- two - one -- ' -- three - one -- ' -- outputting -- having had -- the time -- each operation part -- the pixel o-1 of odd number line-out, and the pixel e-1 of even number line-out -- generating . a selector -- 731 -- 732 -- 733 -- from -- even -- a pixel -- one - two -- ' -- two - two -- ' -- three - two -- ' -- outputting -- having had -- the time -- each operation part -- the pixel o-2 of odd number line-out, and the pixel e-2 of even number line-out -- generating .
[0029] Although an example in the case of making into 1.5 times the horizontal-scanning resolution and vertical-scanning resolution conversion which used interpolation for two points was given in the above explanation, not only the resolution conversion by interpolation but other well-known resolution conversion approaches can be used for this invention for two points. moreover, it cannot be overemphasized that can also boil the scale factor of resolution conversion, and it cannot be restricted 1.5 times, but it can consider as the resolution of arbitration. for example, reference relation in changing resolution twice in the resolution conversion using interpolation for two points, as are shown in drawing 9 (a), and secured every adjoining two lines to the Rhine memory (FIFO) and shown in this drawing (b) -- Rhine after conversion -- ****** -- constituting like is possible.
[0030] Moreover, although the example of the number conversion of Rhine which makes an input an one-line unit (namely, n= 1), and makes an output a two-line unit (namely, m= 2) was shown, it can constitute from the above explanation so that the number of output Rhine of not only this but arbitration may be obtained.
[0031] Moreover, the image processing system shown in drawing 1 is constituted so that vertical-scanning resolution conversion and the number conversion of transfer Rhine may be performed after horizontal-scanning resolution conversion, but the same result can be obtained, even if it constitutes so that vertical-scanning resolution conversion and the number conversion of transfer Rhine may be performed first and horizontal-scanning resolution conversion may be performed after that as this is changed and it is shown in drawing 10 . That is, as shown in drawing 10 , the image information for three lines from the image input section 101 is held in the Rhine memory 103, and conversion of resolution and conversion of the number of Rhine are performed based on the information on those held Rhine by vertical-scanning resolution conversion and the number transducer 106 of transfer Rhine. Although it has the almost same configuration as drawing 7 , since the example of drawing 7 is different, and is not parallel and an input is sent from the Rhine memory 103 by every 1-pixel 8-bit bus width of face, since there is no need, vertical-scanning resolution conversion and the number transducer 106 of transfer Rhine do not possess the selector 731 for parallel-serial conversion. [of 2 pixels of 16-bit bus width of face] The configuration and operation by multipliers 741-746, the multiplier change sections 751-752, and adders 761-762 of drawing 7 are completely the same. The horizontal-scanning resolution transducer 102 has the 1st almost same resolution transducer 1021 for the odd lines of a configuration as the horizontal-scanning resolution transducer 12 of drawing 2 , and the 2nd resolution transducer 1022 for the even lines of the same configuration. the output of the 1st operation part [in / in differing from the configuration of drawing 2 / each resolution transducers 1021 and 1022] 22 (drawing 2), and the 2nd operation part 23 (drawing 2) -- juxtaposition -- not but, it is the point it enabled it to output by turns. Therefore, the 1st resolution transducer 1021 for odd lines is outputted to the image output section 107 from SRAM108B, while it has two SRAM 108A and 108B for odd lines and the output of the 1st operation part 22 is written in SRAM108A, and at the next time, while writing the output of the 2nd operation part 23 in SRAM108B, it is outputted to the image output section 107 from SRAM108A. Similarly, the 2nd resolution transducer 1022 for even lines is outputted to the image output section 107 from SRAM109B, while it has two SRAM 109A and 109B for odd lines and the output of the 1st operation part 22 is written in SRAM109A, and at the next time, while writing the output of the 2nd operation part 23 in SRAM109B, it is outputted to the image output section 107 from SRAM109A.
[0032] In case [than two or more lines which the direction of vertical scanning adjoined to it / more / according to the embodiment of this invention explained above] two or more lines are generated and resolution is changed, since two or more lines are generated to coincidence and it was made to output to coincidence While a configuration becomes easy compared with the conventional technique in which could perform real-time resolution conversion of image data, and the number conversion of transfer Rhine at once, and resolution conversion and the number conversion of transfer Rhine were performed according to the individual, it can manufacture by low cost comparatively, and a high-speed data transfer rate can be realized.
[0033]
[Effect of the Invention] According to this invention, resolution conversion of image data and the number conversion of transfer Rhine can be realized with a comparatively easy configuration, and manufacture can also be realized to low cost, and it can realize at a high-speed-data transfer rate.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, resolution conversion of image data and the number conversion of transfer Rhine can be realized with a comparatively easy configuration, and manufacture can also be realized to low cost, and it can realize at a high-speed-data transfer rate.

[Description of the Prior Art] As the image-processing approach of changing the conventional resolution, performing two-dimensional resolution conversion on real time is indicated by JP,6-18433,B. This approach holds every 2 pixels which adjoins one certain main scanning direction to a shift register, it memorizes them in the 1st Rhine memory, changing the resolution of a main scanning direction by carrying out a interpolation operation in those 2 pixels each, and it is memorized in the 2nd Rhine memory, changing the resolution of the main scanning direction same about one horizontal-scanning Rhine following a degree. By carrying out a interpolation operation in the meantime, the image information of new Rhine generated by interpolation is outputted to a serial one by one, reading the 1st line memory and the 2nd line memory. It is made to carry out two-dimensional resolution conversion to real time, repeating such actuation.

[0003] Moreover, on the occasion of the light beam scan of image formation equipment, the multi-beam scanning mode which aims at high-speed actuation using two or more light beams is known from the former. For example, the image-processing approach of changing into two or more beam (2) output the data transmitted per one line is shown by JP,58-145914,A. This approach has two control sections, the 1st and the 2nd, the 1st control section has two Rhine memory, the 1st and the 2nd, the 2nd control section has two Rhine memory, the 3rd and the 4th, and these 1st and 2nd control sections perform writing and read-out in the Rhine memory by turns. That is, information is read from the 3rd of the 2nd control section, and the 4th Rhine memory to the 1st of the 1st control section, and the 2nd Rhine memory at juxtaposition at the same time it writes the signal of two scan lines where a picture signal adjoins in the 1st period. Conversely, storage information is read from the 1st of the 1st control section, and the 2nd Rhine memory to juxtaposition, it outputs at the 2nd period, and the signal of two scan lines following the 3rd and 4th memory of the 2nd control section is written in. Thus, by outputting to the Rhine memory, carrying out the buffer link of the information for 2 scan lines, conversion for two or more beam output is performed.

[Translation done.]

OPERATION

[Means for Solving the Problem and its Function] This invention has a means (11) to input the 1st image data per n lines, a means (12-16) to change a n line transfer into m (however, m>n) Rhine transfer, and to generate the 2nd image data while high-resolution--ization-processing the 1st image data, and a means (17) to make scan the 2nd image data sent by m line transfer with m beams, and to form the 2nd image. And a means to generate said 2nd image data performs high resolution-ized processing in which the output of high resolution-ized processing becomes m lines, and is characterized by having the Rhine memory holding two or more Rhine which is the need in high resolution-ized processing of the m line-out. After performing resolution conversion of the direction of vertical scanning, and the Rhine transfer conversion even if it constitutes so that resolution conversion of the direction of vertical scanning and the Rhine transfer conversion may be performed after consisting of resolution conversion of a main scanning direction, and resolution conversion of the direction of vertical scanning and performing resolution conversion of a main scanning direction or, specifically, high resolution-ized processing may be constituted so that resolution conversion of a main scanning direction may be performed. In this invention, since a means generated the 2nd image data was constituted so that high resolution-ized processing which is the need about the Rhine memory used for high resolution-ized processing at high resolution-ized processing of m line-out in_which more than one are made into the capacity of Rhine, and the output of high resolution-ized processing becomes m lines might be performed, it can perform high resolution-ized processing and conversion to the m line transfer from a n line transfer at a stretch. Therefore, this invention can time improvement in the speed of a data transfer rate while being able to make circuitry small-scale like the conventional technique compared with performing the number conversion of transfer Rhine, after performing resolution conversion.

[0006] An image input means by which the image processing system by other modes of this invention inputs the 1st image data per n lines (11), The 1st conversion means which performs high resolution-ized transform processing of a main scanning direction (12), the resolution conversion outputted by m lines of the direction of vertical scanning -- it having a required capacity and with the Rhine memory (13-15) holding the image data of two or more lines after the horizontal-scanning resolution conversion by the 1st conversion means By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines It is characterized by having an image output means (17) to make scan the 2nd image data sent by m line transfer from the 2nd conversion means (16) and 2nd conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence with m beams, and to form the 2nd image. This invention holds the conversion output in the Rhine memory, after performing resolution conversion of a main scanning direction with the 1st inverter. The 2nd inverter performs resolution conversion of the direction of vertical scanning using the image data of two or more lines memorized by the Rhine memory. The conversion is constituted so that the output in m lines may be possible, and the image data of a number required to carry out resolution conversion of m line-out to the Rhine memory of Rhine is held. Since this invention performs high resolution-ized processing which is the need about the Rhine memory used for high resolution-ized processing at high resolution-ized processing of m line-out in which two or more capacity of Rhine is secured and the output of high resolution-ized processing becomes m lines, like the above-mentioned, it can perform high resolution-ized processing and conversion to the m line transfer from a n line transfer at a stretch. Therefore, this invention can time improvement in the speed of a data transfer rate while being able to make circuitry small-scale like the conventional technique compared with performing the number conversion of transfer Rhine, after performing resolution conversion.

[0007] In the image processing system of above-mentioned this invention, in the one concrete mode, said 1st conversion means generates the odd-numbered pixel after resolution conversion, and the even-numbered pixel to coincidence, and outputs by making these juxtaposition by the adjoining S pixels (S>=1) interpolation operation. According to this invention, since it can transmit 2 pixels at a time to juxtaposition by carrying out, an image data transfer rate can be substantially made quick.

[0008] In the image processing system of above-mentioned this invention, in the one concrete mode, since it outputs by m line transfer, said 2nd conversion means has m conversion operation part (741-743, the operation part that consists of 751 and 761, 744-746, operation part which consists of 752 and 762) corresponding to output Rhine several m.

[0009] The image processing system by the mode of further others of this invention An image input means to input the 1st image data per n lines (101), The Rhine memory which has a capacity required for the vertical-scanning resolution conversion outputted per m lines, and holds the image data of two or more lines from an image input means (103-105), By carrying out the interpolation operation using the image data of two or more lines memorized by said Rhine memory, and generating the image data of m lines The 1st conversion means which performs vertical-scanning resolution conversion and the number conversion of transfer Rhine to coincidence (106), The 2nd conversion means which performs high resolution-ized transform processing of a main scanning direction for every Rhine of the image

data of m lines which the 1st conversion means outputs, and generates the 2nd image data (102), It is characterized by having an image output means (107) to make scan the 2nd image data sent by m line transfer from the 2nd conversion means with m beams, and to form the 2nd image. The above-mentioned invention can time improvement in the speed of a data transfer rate while the operation effectiveness as the whole is the same and can make circuitry small-scale, although this invention makes reverse sequence of horizontal-scanning resolution conversion and vertical-scanning resolution conversion.

[0010]

[The mode of implementation of invention]

(Mode of the 1st operation) drawing 1 -- the voice of operation of the 1st of this invention -- it is the block diagram showing the configuration of the outline of the image processing system twisted like. This image processing system A document image is scanned. The image obtained The image data of the scan line referred to at resolution transform processing of the image input section 11 inputted per n lines (an example one-line unit), the horizontal-scanning resolution transducer 12 which changes the resolution of the main scanning direction of an input image, and the vertical-scanning resolution transducer 16 mentioned later By FIFO (first-in-first-out mold memory) to hold While changing the resolution of the constituted Rhine memory 13, the light control section 14 which controls the writing to FIFO of the Rhine memory 13, the FIFO lead control section 15 which controls the read from FIFO of the Rhine memory 13, and the direction of vertical scanning It consists of a vertical-scanning resolution transducer 16 which carries out Rhine conversion, and the image output section 17 constituted so that two or more beams might perform an image output. The vertical-scanning resolution transducer 16 is constituted so that it can output per m lines, in order to unite for [in the image output section 17] the beam (this example 2) output of m.

[0011] Drawing 2 is the block diagram showing the detail of the horizontal-scanning resolution transducer 12. The pixel extract circuit 21 for an operation for the horizontal-scanning resolution transducer 12 to extract two or more pixels each required for the horizontal-scanning resolution operation of the image information of the horizontal-scanning line from the image input section 11 (this example 3 pixels) which adjoined to coincidence, The 1st operation part 22 which computes odd pixels after resolution conversion by the interpolation operation based on the pixel for an operation which the pixel extract circuit 21 for an operation extracted, It consists of the 2nd operation part 23 which computes even pixels after resolution conversion by the interpolation operation based on the pixel for an operation which the pixel extract circuit 21 for an operation extracted. The pixel extract circuit 21 for an operation has the latch circuit 211 which delays an input pixel by 1 pixel, and the latch circuit 212 which delays the output of a latch circuit 211 by 1 pixel. The 1st operation part 22 is equipped with the multipliers 221, 222, and 223 which carry out the multiplication of the multiplier for interpolation to the pixel which the pixel extract circuit 21 for an operation outputs, the multiplier change section 224, and the adder unit 225 adding the output of multipliers 221-223. Moreover, the 2nd operation part 23 is equipped with the multipliers 232 and 233 which carry out the multiplication of the multiplier for interpolation to the pixel which the pixel extract circuit 21 for an operation outputs, the multiplier change section 234 for even pixels, and the adder unit 235 adding the output of multipliers 232 and 233.

[0012] Since the latch circuit 211 of the pixel extract circuit 21 for an operation and latch 212 are delayed in 1 pixel, respectively, continuous 3 pixels which the pixel from the image input section 11 which does not pass the r-th pixel to a latch circuit 212, and does not pass the r-1st pixels and a latch circuit to a latch circuit 211 makes the r-2nd pixels are obtained. Namely, the pixel extract circuit 21 for an operation can obtain to coincidence 3 pixels followed on one line (scanning line), and can supply them to a multiplier group. In drawing 3 (a), the 3rd line shows the pixel train as which the 1st line is inputted into the pixel train of the input image to multipliers 223 and 233, and the 2nd line is inputted into multipliers 222 and 232 from a latch circuit 211, and the pixel train inputted into a multiplier 221 from a latch circuit 212. To timing t2, a pixel 2 is obtained by the input side of multipliers 223 and 233, and a pixel 1 is obtained by the input side of multipliers 222 and 232. Henceforth [timing t3], three pixels which adjoined multipliers 221, 222, and 223 and multipliers 232 and 233 in the main scanning direction, respectively are obtained by coincidence.

[0013] a multiplier -- 221 - 223 -- a multiplier -- a change -- the section -- 224 -- and -- an adder -- 225 -- from -- constituting -- having -- an arithmetic circuit -- conversion -- a front -- a pixel -- one -- two -- three -- P - one -- P -- from -- becoming -- an input -- an image -- from -- resolution -- having changed -- odd -- a position -- an output -- a pixel -- one -- ' -- three -- ' -- Q - one -- from -- becoming -- an output -- an image -- obtaining . a multiplier -- 209 -- 210 -- even -- a pixel -- ** -- a multiplier -- a change -- the section -- 211 -- and -- an adder -- 212 -- from -- constituting -- having -- an arithmetic circuit -- conversion -- a front -- a pixel -- one -- two -- three -- P - one -- P -- from -- becoming -- an input -- an image -- from -- resolution -- having changed -- even -- a position -- watch -- ** -- an output -- a pixel -- two -- ' -- a pixel -- four -- ' -- Q -- from -- becoming -- an output -- an image -- obtaining . When doubling resolution 1.5, an example of the resolution conversion by the operation of interpolation is explained below for two points. In addition, the approach of resolution conversion is well-known and can adopt the interpolation approach of arbitration, such as other interpolation between four points.

[0014] The pixel value of pixel 1' = (5/6) the pixel value of the pixel value +(1/6) x pixel 2 of the x pixel 1.
The pixel value of pixel 2' = (1/6) the pixel value of the pixel value +(5/6) x pixel 2 of the x pixel 1.
The pixel value of pixel 3' = (1/2) the pixel value of the pixel value +(1/2) x pixel 3 of the x pixel 2.
The pixel value of pixel 4' = (5/6) the pixel value of the pixel value +(1/6) x pixel 4 of the x pixel 3.
The pixel value of pixel 5' = (1/6) the pixel value of the pixel value +(5/6) x pixel 4 of the x pixel 3.
The pixel value of pixel 6' = (1/2) the pixel value of the pixel value +(1/2) x pixel 5 of the x pixel 4.
The pixel value of pixel 7' = (5/6) the pixel value of the pixel value +(1/6) x pixel 6 of the x pixel 5.
The pixel value of pixel 8' = (1/6) the pixel value of the pixel value +(5/6) x pixel 6 of the x pixel 5.
The pixel value of pixel 9' = (1/2) the pixel value of the pixel value +(1/2) x pixel 7 of the x pixel 6.
...... [0015] odd number -- an output -- a pixel -- ** -- a multiplier -- 221 -- **** -- drawing 3 -- (-- b --) -- being shown -- as -- a pixel -- one -- ' -- seven -- ' -- 13 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- zero -- multiplication -- carrying out -- a pixel -- a pixel -- three -- ' -- nine -- ' -- 15 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 1/2 -- multiplication -- carrying out -- pixel 3', 9', and 15' -- in the timing which asks for -- the multiplication of the multipliers 1/6 be carried out to an input pixel. a multiplier -- 222 -- **** -- a pixel -- one -- ' -- five -- ' -- seven -- ' -- 11 -- ' -- 13 -- ' -- asking -- timing -- setting -- an input pixel -- five sixths -- multiplication -- carrying out -- pixel 3', 9', and 15' -- in the timing which asks for --, the multiplication of the multipliers 1/6 is carried out to an input pixel. a multiplier -- 223 -- **** -- a pixel -- one -- ' -- seven -- ' -- 13 -- ' -- asking -- timing -- setting -- an input -- a pixel -- one -- /-- six -- multiplication -- carrying out -- a pixel -- three -- ' -- five -- ' -- nine -- ' -- 11 -- ' -- asking -- timing -- setting -- an input pixel -- a multiplier 0 -- multiplication -- carrying out . The multiplier by which it multiplies with the above multipliers 221, 222, and 223 for odd number output pixels is changed one by one by the multiplier change section 224.
[0016] As shown in drawing 3 (c), in the multiplier 209 for even number output pixels Pixel 2', eight -- ' -- 14 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- one -- /-- six -- multiplication -- carrying out -- a pixel -- a pixel -- four -- ' -- ten -- ' -- 16 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 5/6 -- multiplication -- carrying out -- pixel 6', 12', and 18' -- in the timing which asks for --, the multiplication of the multipliers 1/2 is carried out to an input pixel. a multiplier -- 210 -- a pixel -- two -- ' -- eight -- ' -- 14 -- ' -- asking -- timing -- setting -- an input -- a pixel -- a multiplier -- five -- /-- six -- multiplication -- carrying out -- a pixel -- a pixel -- four -- ' -- ten -- ' -- 16 -- ' -- the timing which asks for -- setting -- an input pixel -- multipliers 1/6 -- multiplication -- carrying out -- pixel 6', 12', and 18' -- in the timing which asks for --, the multiplication of the multipliers 1/2 is carried out to an input pixel. The multiplier by which it multiplies with the above multipliers 209 and 210 for even number output pixels is changed one by one by the multiplier change section 211 for even pixels.
[0017] In an adder 225, it obtains odd pixels each by addition of the value acquired with multipliers 221-223. For example, an adder 225 performs addition with the pixel value of the x (5/6) pixel 1 which a multiplier 222 outputs, and the pixel value of the x (1/6) pixel 2 which a multiplier 223 outputs, in order to compute the pixel value of pixel 1'. In an adder 212, it obtains even pixels each by adding the value acquired with multipliers 209 and 210. For example, in order to calculate the pixel value of pixel 2', addition with the pixel value of the x (1/6) pixel 1 which a multiplier 209 outputs, and the x (5/6) pixel 2 which a multiplier 210 outputs is performed.
[0018] an adder -- 225 -- outputting -- having -- resolution -- conversion -- a result -- odd -- a position -- a pixel -- one -- ' -- three -- ' -- five -- ' -- an adder -- 212 -- outputting -- having -- even -- a position -- a pixel -- two -- ' -- four -- ' -- drawing 3 -- (-- d --) -- being shown -- as -- a pair -- carrying out -- a juxtaposition output -- carrying out . When a pixel value is expressed with 8 bits, it is connected when odd pixels 8 bits and even pixels 8 bits output to juxtaposition at coincidence, and is held as data with width of face of 16 bits FIFO1 and FIFO3 of the Rhine memory 13. It is written in FIFO1 and FIFO3 FIFO1 and FIFO3 by the write enable signal of the FIFO light control section 14 as the output of the adders 225 and 212 as shown in drawing 3 (d) shows in this drawing (e), and data as shown in this drawing (f) are held in each FIFO. In addition, in this example, odd pixels and even pixels are held to juxtaposition at FIFO, and it was made to transmit to juxtaposition, also when the rate of an output system is quick for enabling it to follow in footsteps enough.
[0019] Drawing 4 shows other examples of the multiplier which performs resolution conversion with interpolation for two points. The view of drawing is the same as drawing 3 . In this case, in the configuration of drawing 2 , a multiplier 223 is omissible.
[0020] Drawing 5 (a) - (k) is drawing for explaining control of write-in read-out in the Rhine memory 13, vertical-scanning resolution conversion, and the number conversion of transfer Rhine. The image after horizontal-scanning resolution conversion (refer to drawing 3 (d)) of drawing 5 (b) is written in FIFO1 of the Rhine memory 13 of drawing 1 by the FIFO1 light signal of drawing 5 (c). A FIFO1 light signal is not generated in the place of Rhine 3, Rhine 7, Rhine 11, and --. It is written in FIFO3 to which each of those signals correspond by the FIFO3 light signal generated in the place corresponding to those Rhine 3 of drawing 5 (d), Rhine 7, Rhine 11, and --. The output of FIFO1 is written

in FIFO2 by the FIFO light signal shown in drawing 5 (e).

[0021] The picture signal of two or more Rhine where the direction of vertical scanning written in FIFO 1-3 of the Rhine memory 13 as mentioned above adjoined is read by the FIFO lead signal of drawing 5 (f), and is supplied to vertical-scanning resolution conversion and the input of the number transducer 16 of transfer Rhine. the data with which drawing 5 (g) - (k) was read in FIFO 1-3 -- and two or more Rhine data generated by performing the direction resolution conversion of vertical scanning and the number conversion of transfer Rhine are shown with time. Moreover, drawing 6 shows the relation between Rhine before conversion, and Rhine after conversion. In addition, in drawing 6 , the bottom Rhine before conversion is the same as Rhine before conversion of the top of drawing, in order to make drawing legible, overlaps and is shown.

[0022] the data of FIFO2 to the 1st line -- the data of FIFO1 to the 2nd line -- reading -- the -- the data of Rhine after conversion of 1 'line and 2nd [**]' line are generated. the following FIFO lead signal -- the data of FIFO1 to the 4th line -- the data of FIFO2 to the 2nd line -- the data of FIFO3 to the 3rd line -- respectively -- reading -- 3'line after [the data of the 2nd line, and the data of the 3rd line to] conversion -- generating -- the 3' after [the data of the 3rd line, and the data of the 4th line to] conversion -- line is generated. furthermore, the following FIFO lead signal -- the data of FIFO1 to the 5th line -- the data of FIFO2 to the 4th line -- the data of FIFO3 to the 3rd line -- respectively -- reading -- the [after / the data of the 3rd read line, and the data of the 4th line to / conversion] -- 5'line -- generating -- the 6' after [the data of the 4th line, and the data of the 5th line to] conversion -- line is generated. The relation shown in drawing 5 and drawing 6 performs resolution conversion of the direction of vertical scanning, and the number conversion of transfer Rhine, repeating such actuation. The capacity of three lines which consists of FIFO1-FIFO3 the Rhine memory used for high resolution-ized processing is secured, and since it is the configuration of performing high resolution-ized processing in_which the output of high resolution-ized processing becomes two lines, high resolution-ized processing and conversion to the m line transfer (in this example, it transmits 2 line) from a n line transfer (in this example, it transmits 1 line) can be performed to coincidence. [required for high resolution-ized processing of 2 (namely, m= 2) line-out]

[0023] Drawing 7 is what shows the outline of the configuration of the equipment for performing the vertical-scanning resolution conversion and the number conversion of transfer Rhine which were explained above. The selectors 731-733 for separating the pixel which connects with juxtaposition and is held in the registers 721-723 holding the pixel by which a sequential output is carried out from each FIFO with a FIFO lead lock, and a register, It has the multipliers 744-746 for performing resolution conversion the multiplier 741 for performing resolution conversion for odd-line generation, and the number conversion of transfer Rhine - for 743 or even-line generation, and the number conversion of transfer Rhine, the multiplier change sections 751 and 752, and addition 761 and 762.

[0024] Drawing 8 shows the pixel group of Rhine after conversion generated from the pixel read from FIFO one by one with a FIFO lead clock, and its pixel. Every 2 pixels connected with the juxtaposition held with the FIFO lead clock at each FIFO are read to registers 721, 722, and 723. 1 pixel is chosen at a time by selectors 731, 732, and 733, and 2 pixels of juxtaposition in a register are given to multipliers 741, 742, and 743. That is, selectors 731, 732, and 733 change and output the juxtaposition pixel held at registers 721, 722, and 723 to a serial pixel.

[0025] The operation for vertical-scanning resolution conversion is similar with the operation at the time of the main resolution conversion. According to the scanning-line information currently held at FIFO 1-3, the scanning-line information after each conversion is computed from two or more scanning-line information before conversion by the relation according to drawing 6 . Conversion of two or more line output will also be performed to coincidence by conversion generating two scanning-lines (generally m) information to coincidence, and outputting each to coincidence. the [which is odd lines after / the image information of the 1st line before conversion, and the 2nd line to / conversion as shown in drawing 6] -- the image information of 1 '2ndwhich is line and even lines' line is computed. The operation for obtaining odd lines after conversion carries out the multiplication of the predetermined multiplier to multipliers 741-743 from **, adds them to the pixel value (8-bit information which selectors 731-733 output) of the pixel to which two line(s) correspond with an adder 761, and is performed by acquiring the pixel value of the corresponding pixel in Rhine after resolution conversion. The operation for obtaining even lines after conversion is performed by acquiring the pixel value of the pixel which carries out the multiplication of the predetermined multiplier to multipliers 744-746 from **, adds them to the pixel value of the pixel to which two line(s) correspond with an adder 762, and corresponds to it.

[0026] that is, it is shown in drawing 6 -- as -- the -- the pixel value of 1'line is calculated by the operation of pixel value x (multipliers 1/6) of the pixel value x(multipliers 5/6)+2nd line of the 1st line. A multiplier 742 performs pixel value x (multipliers 5/6) of the 1st line, it performs the operation of pixel value x (multipliers 1/6) of the 2nd line with a multiplier 741, and performs addition of these multiplication results with an adder 761. the -- the pixel value of 2'line is calculated by pixel value x (multipliers 5/6) of the pixel value x(multipliers 1/6)+2nd line of the 1st line. A multiplier 745 performs pixel value x (multipliers 1/6) of the 1st line, it performs the operation of pixel value x (multipliers 5/6)

of the 2nd line with a multiplier 744, and performs addition of these multiplication results with an adder 762. the -- the pixel value of 3'line is calculated by pixel value x (multipliers 1/2) of the pixel value x(multipliers 1/2)+3rd line of the 2nd line. A multiplier 742 performs the multiplication of pixel value x (multipliers 1/2) of the 2nd line, and a multiplier 743 performs the multiplication of pixel value x (multipliers 1/2) of the 3rd line. the -- the pixel value of 4'line is calculated by pixel value x (multipliers 1/6) of the pixel value x(multipliers 5/6)+4th line of the 3rd line, a multiplier 746 performs the operation of pixel value x (multipliers 5/6) of the 3rd line, and a multiplier 744 performs the operation of pixel value x (multipliers 1/6) of the 4th line. the -- the pixel value of 5'line is calculated by pixel value x (multipliers 5/6) of the pixel value x(multipliers 1/6)+4th line of the 3rd line, a multiplier 743 performs the operation of pixel value x (multipliers 1/6) of the 3rd line, and a multiplier 742 performs the operation of pixel value x (multipliers 5/6) of the 4th line. the -- the pixel value of 6'line is calculated by pixel value x (multipliers 1/2) of the pixel value x(multipliers 1/2)+5th line of the 4th line, a multiplier 745 performs the operation of pixel value x (multipliers 1/2) of the 4th line, and a multiplier 744 performs the operation of pixel value x (multipliers 1/2) of the 5th line. From an adder 761 and an adder 762, it is outputted to coincidence for pixel each the addition of odd-pixel Rhine and even lines of every.

[0027] the 1' explained above -- line - the 6' -- it can carry out and resolution conversion of an image can be performed by [which repeat periodically the conversion actuation which obtains line every 6 next line(s)] going. And since odd lines and even lines are outputted to coincidence, the number conversion of Rhine can also be performed to coincidence.

[0028] Drawing 8 is drawing for explaining the relation between the pixel of Rhine held at FIFO, and the pixel of two or more lines after conversion. a selector -- 731 -- 732 -- 733 -- from -- odd -- a pixel -- one - one -- ' -- two - one -- ' -- three - one -- ' -- outputting -- having had -- the time -- each operation part -- the pixel o-1 of odd number line-out, and the pixel e-1 of even number line-out -- generating . a selector -- 731 -- 732 -- 733 -- from -- even -- a pixel -- one - two -- ' -- two - two -- ' -- three - two -- ' -- outputting -- having had -- the time -- each operation part -- the pixel o-2 of odd number line-out, and the pixel e-2 of even number line-out -- generating .

[0029] Although an example in the case of making into 1.5 times the horizontal-scanning resolution and vertical-scanning resolution conversion which used interpolation for two points was given in the above explanation, not only the resolution conversion by interpolation but other well-known resolution conversion approaches can be used for this invention for two points. moreover, it cannot be overemphasized that can also boil the scale factor of resolution conversion, and it cannot be restricted 1.5 times, but it can consider as the resolution of arbitration. for example, reference relation in changing resolution twice in the resolution conversion using interpolation for two points, as are shown in drawing 9 (a), and secured every adjoining two lines to the Rhine memory (FIFO) and shown in this drawing (b) -- Rhine after conversion -- ****** -- constituting like is possible.

[0030] Moreover, although the example of the number conversion of Rhine which makes an input an one-line unit (namely, n= 1), and makes an output a two-line unit (namely, m= 2) was shown, it can constitute from the above explanation so that the number of output Rhine of not only this but arbitration may be obtained.

[0031] Moreover, the image processing system shown in drawing 1 is constituted so that vertical-scanning resolution conversion and the number conversion of transfer Rhine may be performed after horizontal-scanning resolution conversion, but the same result can be obtained, even if it constitutes so that vertical-scanning resolution conversion and the number conversion of transfer Rhine may be performed first and horizontal-scanning resolution conversion may be performed after that as this is changed and it is shown in drawing 10 . That is, as shown in drawing 10 , the image information for three lines from the image input section 101 is held in the Rhine memory 103, and conversion of resolution and conversion of the number of Rhine are performed based on the information on those held Rhine by vertical-scanning resolution conversion and the number transducer 106 of transfer Rhine. Although it has the almost same configuration as drawing 7 , since the example of drawing 7 is different, and is not parallel and an input is sent from the Rhine memory 103 by every 1-pixel 8-bit bus width of face, since there is no need, vertical-scanning resolution conversion and the number transducer 106 of transfer Rhine do not possess the selector 731 for parallel-serial conversion. [of 2 pixels of 16-bit bus width of face] The configuration and operation by multipliers 741-746, the multiplier change sections 751-752, and adders 761-762 of drawing 7 are completely the same. The horizontal-scanning resolution transducer 102 has the 1st almost same resolution transducer 1021 for the odd lines of a configuration as the horizontal-scanning resolution transducer 12 of drawing 2 , and the 2nd resolution transducer 1022 for the even lines of the same configuration. the output of the 1st operation part [in / in differing from the configuration of drawing 2 / each resolution transducers 1021 and 1022] 22 (drawing 2), and the 2nd operation part 23 (drawing 2) -- juxtaposition -- not but, it is the point it enabled it to output by turns. Therefore, the 1st resolution transducer 1021 for odd lines is outputted to the image output section 107 from SRAM108B, while it has two SRAM 108A and 108B for odd lines and the output of the 1st operation part 22 is written in SRAM108A, and at the next time, while writing the output of the 2nd operation part 23 in SRAM108B, it is outputted to the image output section 107 from SRAM108A. Similarly, the 2nd resolution transducer 1022 for even lines is outputted to the image output section 107

from SRAM109B, while it has two SRAM 109A and 109B for odd lines and the output of the 1st operation part 22 is written in SRAM109A, and at the next time, while writing the output of the 2nd operation part 23 in SRAM109B, it is outputted to the image output section 107 from SRAM109A.

[0032] In case [than two or more lines which the direction of vertical scanning adjoined to it / more / according to the embodiment of this invention explained above] two or more lines are generated and resolution is changed, since two or more lines are generated to coincidence and it was made to output to coincidence While a configuration becomes easy compared with the conventional technique in which could perform real-time resolution conversion of image data, and the number conversion of transfer Rhine at once, and resolution conversion and the number conversion of transfer Rhine were performed according to the individual, it can manufacture by low cost comparatively, and a high-speed data transfer rate can be realized.

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the configuration of the outline of the image processing system which this invention twists like 1 operative condition
[Drawing 2] Drawing showing the example of a configuration of a horizontal-scanning resolution transducer
[Drawing 3] Drawing for explaining actuation of a horizontal-scanning resolution transducer
[Drawing 4] Drawing for explaining actuation of the modification of a horizontal-scanning resolution transducer
[Drawing 5] The wave form chart for explaining control of the Rhine memory
[Drawing 6] Drawing showing the relation of whether Rhine of the image after conversion generates from Rhine of the image before which conversion
[Drawing 7] Drawing showing vertical-scanning resolution conversion and the configuration of the number transducer of output Rhine
[Drawing 8] Drawing for explaining the relation between the pixel of Rhine held at FIFO, and the pixel of two or more lines after conversion
[Drawing 9] (a) And drawing showing the relation of whether Rhine of the image after conversion in the case of changing (b) resolution into 1200dpi from 600dpi generates from Rhine of the image before which conversion
[Drawing 10] The block diagram showing the configuration of the outline of the image processing system by other embodiments of this invention
[Description of Notations]
11 -- The image input section, 12 -- A horizontal-scanning resolution transducer, 13 -- Rhine memory, 14 -- A FIFO light control section, 15 -- A FIFO lead control section, 16 -- Vertical-scanning resolution conversion and the number transducer of transfer Rhine, 17 -- The image output section, 21 -- The pixel extract circuit for an operation, 211,212 -- Latch circuit, 22 [-- An adder, 23 / -- The 2nd operation part, 721-733 / -- A register, 731-733 / -- A selector, 741-743 / -- A multiplier, 75 / -- The multiplier change section, 76 / -- Adder.] -- The 1st operation part, 221-223 -- A multiplier, 224 -- The multiplier change section, 225

[Translation done.]